18. Compare and contrast Physical Vapour Deposition (PVD) and Chemical Vapour Deposition (CVD) techniques in terms of processes, applications, and limitations.

19. Explain the principle, construction and working of SEM.

20. Explain the photo catalytic process used for air purification, including the materials involved, the reaction mechanism, and practical applications.



APRIL/MAY 2025

## 23PEPH25A — PHYSICS OF NANOSCIENCE AND TECHNOLOGY

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Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Define quantum dots.

2. Mention two differences between nanomaterials and bulk materials.

3. What is meant diluted magnetic semiconductor (DMS)?

4. Give the significance of lattice constant in nanomaterials.

5. What is meant by wet deposition techniques?

6. List out the applications of nanolithography.

7. How does UV-visible spectroscopy help in determining band gap energy?

8. What is Power X-ray Diffraction (XRD).

9. Explain the role of carbon nanotube emitters in electronic devices.

10. What is supercapacitor and what are its advantages?

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Describe the properties of quantum wells.

Or

(b) What are the main characteristic of semiconductor nanomaterials?

12. (a) Discuss the elastic properties of nanomaterials.

Or

(b) What are ferroelectric materials, and how do they behave at the nanoscale?

13. (a) How does ball milling helps in synthesizing nanomaterials?

Or

(b) Discuss the advantages of electrospinning in creating nano-sized fibers.



14. (a) How can TEM provide atomic-scale information about a material's structure?

Or

(b) Explain the main difference between Scanning Probe Microscopy (SPM) and Scanning Tunneling Microscopy (STM).

15. (a) Describe the advancements in display screens due to nanotechnology and their impact on consumer electronics.

Or

(b) Explain the principles of drug delivery systems based on nanotechnology and their benefits over conventional methods.

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SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Explain OD, 1D and 2D nano structured materials.

17. Describe the optical properties of nanomaterials in detail, with a special focus on Surface Plasmon Resonance and quantum size effects.